

AMENDMENTS TO THE SPECIFICATION

Please amend the specification by inserting the following paragraph at page 7, between lines 13 and 14 of the current specification:

When introducing the bromine chloride or bromine into the aqueous solution of alkali metal salt of sulfamic acid, it is desirable to maintain the desired pH of the resulting solution at 7 or above by also introducing into the solution (continuously or intermittently, as desired) additional alkali metal base, such as by a co-feed of an aqueous solution of alkali metal base.

Please amend the specification by inserting at page 20, between lines 9 and 10 of the current specification, the following paragraphs:

The following Examples are presented for purposes of illustration and not limitation.

EXAMPLES

Various compositions were prepared and the active bromine content of the resultant compositions was determined analytically. The conditions used and results obtained (observations on odor and vapor, and initial contents of active bromine in the solutions) are summarized in Table 1.

Table 1 - Data on Prepared Sulfamic Acid Stabilized Bromine Solutions

Ex. No.	Halogen	pH	SA _{eq}	Odor and Vapor Comments	Active Br ₂ , wt%
1	Br ₂	13.0	1.42	Slight sweet smell, no observed vapor	12.4 %*
2	Br ₂	7.0	1.48	Slight Br odor, no fuming	13.4 %*
3**	BrCl	7	0.92	Strong Br odor, slight fuming	11.2 %
4	Br ₂	13.0	1.15	Slight sweet smell, no observed vapor	19.6 %

5	Br ₂	7.0	1.13	Moderate Br odor, no fuming	26.7 %
6	BrCl	12.5	0.94	Slight sweet smell, no observed vapor	18.0 %
7	BrCl	12.8	1.41	Slight sweet smell, no observed vapor	17.6 %

SA_{eq} = Sulfamic acid to halogen mole ratio.

* Measured with Hach spectrometer; all others titrated using starch-iodine-sodium arsenite method.

** Comparative example.

The specific details for Examples 3-7 of the Table are given below.

EXAMPLE 3

Bromine Chloride, Caustic and Sodium Sulfamate at Neutral pH

A 1 liter flask was charged with 52.0 g of sulfamic acid and 250 g of water. Sodium sulfamate was prepared by adding 60.0 g of 50% sodium hydroxide to the stirred slurry. Bromine chloride was prepared by adding 20 g of chlorine to 47.0 g of bromine. This bromine chloride was then co-fed with 210 g of 25% sodium hydroxide to maintain the pH between 6 and 8. 5 mL of 1 M Hydrochloric Acid were added to bring the final pH to approximately 7±0.5. The solution, which contained some solids, was transferred to an amber bottle for storage. Starch-iodine titration of a sample of the solution indicated that it had an active bromine concentration of 11.2%.

EXAMPLE 4

Bromine, Caustic (50% Sodium Hydroxide) and Sodium Sulfamate

A 500 mL flask was charged with 26.0g of sulfamic acid and 50 g water. To this slurry was added 35.0 g of 50% sodium hydroxide. As the acid was converted to the sodium salt, it dissolved into the aqueous solution more readily. Bromine (37.0 g) and 50% sodium hydroxide (30.0 g) were co-fed into the solution at a rate which maintained the pH between 11 and 13. After all of the bromine and caustic had been added, the contents were transferred to an amber bottle for storage. Starch-iodine titration of a sample of the solution indicated that it had an active bromine concentration of 19.6%. Analysis of the bromine solution after 6 weeks of

storage at ambient temperature indicated that it still contained more than 95% of its active bromine content.

EXAMPLE 5

Bromine, Caustic and Sodium Sulfamate at Neutral pH

A 500 mL flask was charged with 26.0 g of sulfamic acid and 50 g of water. To this stirred slurry was added 30.9 g of 50% sodium hydroxide, which raised the initial pH to approximately 12. The sulfamic acid then dissolved into solution. Bromine (37.7 g) was fed into the solution until the pH dropped to approximately 7, when 50% sodium hydroxide (10.9 g) was co-fed to maintain the pH between 6 and 9. 5 mL of 0.01 N sodium hydroxide was used to bring the final pH to approximately 7 ± 0.5 . The contents were then transferred to an amber bottle for storage. Starch-iodine titration of a sample of this solution indicated that it had an active bromine content of 26.7%. Analysis of the solution after six weeks of storage at ambient temperature indicated that the stabilized bromine solution still contained more than 95% of its active bromine content.

EXAMPLE 6

Bromine Chloride, Caustic and Sodium Sulfamate

A 1 liter flask was charged with 107 g of sulfamic acid and 200 g of water. Sodium sulfamate was prepared by adding 93.9 g of 50% sodium hydroxide to the stirred slurry. Bromine chloride was prepared by adding 39 g of chlorine to 96.0 g of bromine. This bromine chloride was the co-fed with 319 g of 50% sodium hydroxide to maintain the pH between 11 and 13. After stirring for an additional 30 minutes, the solution, which contained some solids, was transferred to an amber bottle for storage. Starch-iodine titration of a sample of the solution indicated that it had an active bromine concentration of 18.0%. Analysis of the solution after three weeks at ambient temperature indicated that the stabilized bromine solution still contained more than 90% of its active bromine content.

EXAMPLE 7

Bromine Chloride, Caustic and Sodium Sulfamate; larger scale

A 5 liter flask was charged with 470 g of sulfamic acid and 900 g of water. Sodium sulfamate was prepared by adding 436 g of 50% sodium hydroxide to the stirred slurry. Bromine chloride was prepared by adding 120 g of chlorine to 276 g of bromine. This bromine chloride was the co-fed with 1723 g of 50% sodium hydroxide to maintain the pH between 12 and 13. After stirring for an additional 60 minutes, the orange, clear solution was transferred to an polyethylene bottle for storage. Starch-iodine titration of a sample of the solution indicated that it had an active bromine concentration of 17.6%.